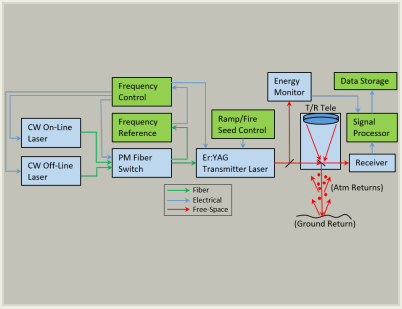
Compact Methane Sensing Lidar for Unmanned Aerial Vehicles, Phase I

Completed Technology Project (2016 - 2016)

Project Introduction

Even though gaseous methane (CH4) is a comparatively sparse constituent in Earth's atmosphere, it is the third most impactful greenhouse gas after water vapor and carbon dioxide, and the second most important in terms of anthropogenic drivers. Methane is some 60 times more effective than CO2 in absorbing long-wavelength radiation, because the methane absorption lines in that part of the spectrum are less saturated and have less overlap with water vapor lines. Natural and agricultural sources of methane continue to dominate, but are difficult to separate and quantify. World-wide, rice cultivation, biomass burning, ruminant farm animals, and fossil fuel mining and usage have long been the most powerful drivers, but with climate change these sources could be dwarfed in the future by the release of enormous quantities of methane from melting permafrost and/or methane hydrates currently buried deep in ocean sediment. Innovative new remote sensing technologies need to address the atmospheric methane concentration measurement problem for NASA and other applications. Beyond Photonics proposes to investigate specific very compact pulsed lidar designs near the 1.645-micron wavelengths of interest by NASA for atmospheric methane (CH4) and potentially water vapor in the same nominal wavelength region. Specifically, methane concentration from moderate-sized unmanned aerial vehicles of NASA's choice will be a focus; this application puts particular emphasis on decreasing size, weight, and prime power (SWaP) and eliminating active laser component cooling. Particular emphasis will also be placed on ensuring that the lidar designs are compatible with scaling to space qualification in future such programs. Emphasis will also be placed on technical approaches with good operational flexibility in terms of pulse energy and duration, frequency agility, and application to other IR and SWIR wavelengths.



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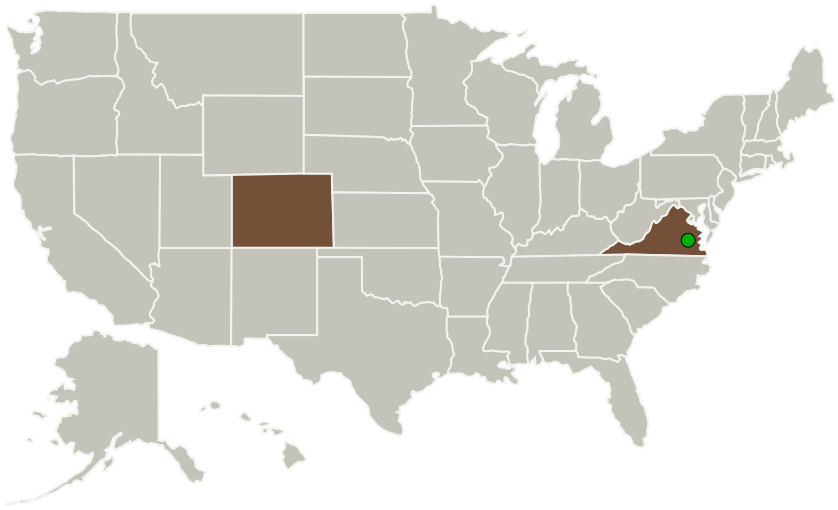
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Beyond Photonics LLC	Lead Organization	Industry	Lafayette, Colorado
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Colorado	Virginia

Project Transitions

June 2016: Project Start

December 2016: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140279)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Beyond Photonics LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

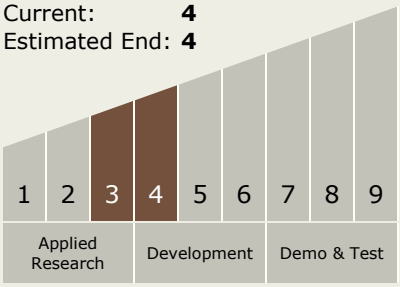
Carlos Torrez

Principal Investigator:

Sammy Henderson

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



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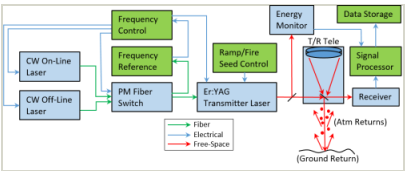
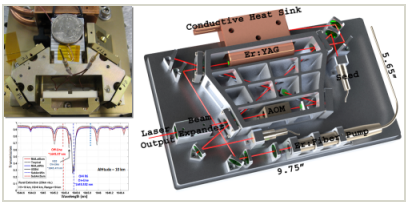
Images



Briefing Chart Image
Compact Methane Sensing Lidar for Unmanned Aerial Vehicles, Phase I *(https://techport.nasa.gov/image/134998)*



Final Summary Chart Image
Compact Methane Sensing Lidar for Unmanned Aerial Vehicles, Phase I Project Image *(https://techport.nasa.gov/image/127774)*

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.5 Lasers

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System